

## REMARKS

Favorable reconsideration is respectfully requested.

The claims are 1 to 14.

The above amendment is responsive to points set forth in the Official Action as will be discussed below.

Regarding the objection to the Declaration, a new Declaration setting forth the application number of the present application and its filing date (see page 3) and the filing date of the 371 PCT is included.

With regard to the objection to claims 1 to 11, the Examiner's suggestion has been adopted.

With regard to the rejection of claims 3 and 8 to 9, these claims have been amended to delete the term "preferably" and to insert such limitation in new claims 12 to 14.

Claims 1 to 3, 5 to 7 and 9 have been rejected under 35 USC 102(b) as anticipated by Kokubo et al. (U.S. 3,637,686).

This rejection is respectfully traversed.

Kokubo teaches a process for recovering melamine from a high pressure melamine process, wherein melamine melt is first cooled with liquid  $\text{NH}_3$  or cool  $\text{NH}_3$  gas to a temperature of 200 to 270°C, whereby the melamine is solidified (col. 2, lines 5 - 7). Then the solidified melamine is further cooled with an aqueous solution containing  $\text{NH}_3$  and the melamine crystals are isolated.

According to the present claims, the melamine melt is first cooled to a temperature which is 1 to 50°C above the melting point of melamine dependent on the respective ammonia pressure with the addition of ammonia, and then the still liquid melamine is, according to part b) of claim 1, quenched with cold liquid or gaseous  $\text{NH}_3$ , whereby the melamine is solidified and then further cooled with aqueous  $\text{NH}_3$ .

The cooling of the melamine melt to 1 - 50°C above its melting point before quenching with water or quenching with ammonia followed by cooling with water is not at all disclosed by Kokubo.

Claims 1-3, 5-7 and 9-11 are rejected under 35 USC 103(a) as being unpatentable over Kokubo et al. (U.S. 3,637,686) in view of Elvers et al., Ullmann's Encyclopedia of Industrial Chemistry, 5<sup>th</sup> Edition, Vol. A16, 174-179, 1978.

This rejection is also respectfully traversed.

The essence of the present invention is that the cooling of a melamine melt to 1 - 50°C above its melting point before further treatment with aqueous NH<sub>3</sub> results in a melamine of better quality and higher yield, even if it is then treated or quenched with water.

The Examiner correctly notes that the reuse of recovered ammonia, the recovery of residual melamine in the off-gases etc. are standard process practice as can be seen from Ullmann's Encyclopedia. But the combination of the present invention with the standard procedures cannot be arrived at from the cited references.

Kokubo further teaches in his 2-step process for recovering solid melamine, that melamine can be excellently recrystallized from water, since the solubility of melamine in water increases exponentially with the temperature, and also impurities such as melam, ureidomelamine are at temperatures of 100 - 200°C and at NH<sub>3</sub>-concentrations of 5 - 25 % destroyed, but this is accompanied by an increased rate of melamine hydrolysis at these NH<sub>3</sub>-concentrations, with the undesirable result that although the melamine purity ostensibly improves, its yield drops heavily (column 3, lines 17 - 24).

Why should the person skilled in the art perform an additional treatment (i.e. adding liquid or gaseous NH<sub>3</sub> to the melamine melt to cool the melt), if he would reasonably expect that due to the following water treatment the melamine yield drops heavily, hydrolysis products are produced and in addition, the amount of NH<sub>3</sub> which was introduced to cool the melamine melt has to be recovered from the mother liquors at the end of the day?

For the foregoing reasons, it is apparent that the rejection of Kokubo in view of Elvers et al. (Ullmann's Encyclopedia) is untenable, is based on hindsight and should be withdrawn.

Claims 1-11 are rejected under 35 USC 103(a) as being unpatentable over Canzi et al. (U.S. 5,721,363) in view of Van Hardeveld (U.S. 4,408,046).

This rejection is also respectfully traversed.

Regarding Van Hardeveld (U.S. 4,409,046), if melamine, coming from a high pressure or from a low pressure urea converting process, is cooled and crystallized with water or an aqueous medium, the aqueous medium still contains some (not crystallized) melamine and hydrolysis products such as ammeline and ammelide. Therefore the mother liquor was recycled into the melamine process, but leaving the problem that the by-products accumulated in the mother liquor (state of the art before Van Hardeveld, cited in Van Hardeveld, column 1, lines 5 - 22). Van Hardeveld found out that the build up of by product-impurities in the recycle of mother liquors can be stabilized, if only a small portion (about 10%) of the mother liquor is subjected to a certain purification treatment, thereby reducing substantially the energy requirements. (Van Hardeveld, column 1, lines 47 - 53).

This energy saving treatment of melamine mother liquor can of course be utilized in any process involving crystallization of melamine in an aqueous medium, but by no means does it make obvious the present invention, i.e. the cooling of a melamine-melt above its melting point and then treatment with aqueous media, thereby resulting in melamine of better quality and higher yield.

The essence of Canzi (U.S. 5,721,363) is the slow and controlled cooling of a melamine melt to 330°C to 270°C at NH<sub>3</sub>-pressures of 50 - 400 bar, whereby higher values of NH<sub>3</sub> pressure permit more rapid cooling rates and vice versa, whereupon the reaction vessel is depressurized and cooled to room temperature and pure melamine is obtained in powder form.

Canzi also teaches a residence time of 0 - 8 hours of liquid melamine between 430°C and the melting point of melamine, i.e. such as residence time is possible, he does not teach the addition of NH<sub>3</sub> and the cooling of the melt to a temperature of 1 - 50°C above its melting point. Canzi does not teach any treatment with water.

From Canzi, it would not be obvious to cool down the melt to a defined level above its melting point with the aid of NH<sub>3</sub>, and a) quench it with aqueous medium or b) solidify the melt with NH<sub>3</sub> and treat it immediately with aqueous medium. And by no means is it obvious that despite of the water treatment the purity and the yield of the finally obtained melamine is increased.

In order to emphasize the unobviousness of the present process, there is submitted herewith the Rule 132 Declaration of inventor Coufal which shows that the cooling of the melamine melt to a defined level above its melting point, followed by aqueous working up according to the presently claimed method results in unexpectedly higher yield plus higher purity of the obtained melamine.

It is also apparent that the present invention is not a mere optimization of prior art conditions or based on "routine" experimentation (of course, this is not a basis for rejection).

To the extent that the prior art constitutes a *prima facie* case of obviousness, such is rebutted by the attached Declaration for reasons stated above.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact undersigned at the telephone number below.

Respectfully submitted,

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

### IN THE CLAIMS:

*Claims 1 to 11 have been amended as follows:*

1. (Amended) [Method] A method for producing pure melamine [characterized in that] wherein the melamine melt prepared from urea in a high-pressure process, optionally after stripping of the off-gases and optionally after dwelling in an ageing container, is cooled to a temperature which is about 1 to 50°C above the melting point of melamine dependent on the respective ammonia pressure, with the addition of ammonia, after which either

- a) quenching is effected with water or an aqueous ammonia- and/or melamine-containing solution or suspension and the melamine is solidified - or
- b) quenching is effected with cold liquid or gaseous ammonia, the melamine solidifying and then being further cooled in a second step with water or an aqueous ammonia- and/or melamine-containing solution or suspension and
- c) the melamine is then isolated.

2. (Amended) [Method] The method according to Claim 1, [characterized in that] wherein the cooling of the melamine melt to the temperature which is from about 1 to 50°C above the melting point of the melamine is effected by passing in cold liquid or gaseous ammonia.

3. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] wherein the melamine obtained according to a) or b) and present as a suspension is dissolved by feeding in an aqueous ammoniacal solution, [preferably a recycled mother liquor obtained in the crystallization,] the solution is optionally mixed with NaOH and, if required, allowed to dwell, the dissolved ammonia is, if required, stripped, filtration is then effected and the melamine is crystallized and isolated.

4. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] wherein the melamine melt is quenched in stage a) by means of recycled mother liquor obtained in the crystallization.

5. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] wherein the melamine melt is cooled to a temperature which is from about 1 to 50°C above the melting point of the melamine, at an ammonia pressure of from about 50 to 1000 bar while feeding in ammonia.

6. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] wherein the melamine melt is cooled to a temperature which is from about 1 to 30°C above the melting point of the melamine.

7. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] wherein the melamine melt is cooled to a temperature which is from about 1 to 50°C above the melting point of the melamine, by passing in ammonia for from about 1 min to 10 h.

8. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] wherein quenching is effected in stage a) at a temperature of from about 25°C to 300°C, [preferably from about 50°C to 200°C] and a pressure of from about 1 to 100 bar[, preferably from about 1 to 50 bar].

9. (Twice Amended) [Method] The method according to Claim 1, [characterized in that] quenching is effected in stage b) at a temperature of from about 200°C to 270°C and a pressure of from about 1 to 100 bar, [preferably from about 1 to 50 bar] and further cooling is then effected in the second step to about 50°C to 200°C.

10. **(Twice Amended) [Method]** The method according to Claim 1, **[characterized in that]** melamine and urea are washed out of the off-gases of the melamine reactor by means of a urea melt which simultaneously heats up, and the urea melt is then fed to the melamine synthesis in a melamine reactor and the off-gases are fed to a urea reactor.

11. **(Amended) [Method]** The method according to Claim 10, **[characterized in that]** wherein the off-gases freed from melamine and urea are condensed, optionally with the aid of ammonium carbonate solution and/or ammonium carbamate solution which are taken off from a urea plant or the melamine plant, and the resulting heat is used for preheating the liquid ammonia used in the urea plant or for the production of steam.